

Software Reviews

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EQUATIONS Challenge Matches

This software enables the computer to serve as a guide, gameboard, coach and tutor in an EQUATIONS match between two players or teams. The EQUATIONS program covers a broad range of topics including arithmetic operations, root, logs, percents algebra, and more. Each software package includes an introduction disk. Developing problem solving skills are part of the objectives. For grades 4-12. **Strengths:** Strong range of methods and strategies; useful documentation. **Overall Evaluation:** Excellent learning tool that, although information is presented slowly, provides a wide range of strategies that prompt the user to think in a challenged manner.

The Big Book of Home Learning - Mary Pride, 1987

EQUATIONS

EQUATIONS, that peerless math game, is now computerized. Schools may want to look into outfitting their math classrooms with the DIG (Diagnostic Instructional Gaming) Math EQUATIONS-based program. Useful for classes from fourth grade through high school, DIG Math dramatically increases students ability to apply math concepts taught in the program.

Not every school will be enlightened enough to get DIG, so WFF 'N PROOF has produced a home mini-version with an Introduction to EQUATIONS and some EQUATIONS Challenge Matches. It is much easier to learn to play EQUATIONS this way, and the computer will match wits with you even if nobody else feels bright enough to do so.

EQUATIONS, as we have intimated in the math chapter, is the Porsche of math games. Schoolkids who play it industriously do far, far better at math than they have ever done before. Get it for Junior and see his brains bulge.

WFF 'N PROOF is in the process of computerizing their entire line of brainbusters. Write if you want to find out what they're up to.

Note: Publisher's response to these reviews appears on the reverse side of this page.

Booklist
American Library Assoc.
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EQUATIONS

An involving computer implementation of the manual group of games by the same name, this software focuses on the development of effective problem-solving and higher-order thinking skills. Each player enters the game at his or her own mathematical skill level. At the game's simplest level, numbers and mathematical operators are given, and a numerical goal is set; players then compete to find solutions that are equations equal to the goal. One element of the set at a time is placed into one of three categories: required, forbidden, or permitted. Required means that the element must be present in the solution; an element that is forbidden cannot be in the solution; permitted means that it is the player's option whether that element is part of the equation solution. The excellent introduction in the tutorial effectively instructs the user on the rules and operation of the game and provides practice matches. Some time and effort are needed to learn and understand the rules and operation of the game, but once they are mastered, players will be captivated. Included with the package are the DIG Math Preview Disk and one to four Challenge Matches disk(s) (available at varying levels of difficulty from elementary to advanced). Developed by the Instructional Gaming Group at the University of Michigan, this highly recommended software can provide rich learning experiences that increase math achievement while heightening student motivation. Ages 12-adult. PG.

The Mathematics Teacher
N.C.T.M.
Vol. 80 No. 3 March 1987

The DIG Math Program

This program is an ambitious and reasonably successful attempt to teach many algebraic concepts in a game setting. Students are given the chance to exploit their full understanding of a wide range of topics, including fractions, integers, word problems, exponents, and polynomials. For those familiar with EQUATIONS: The Game of Creative Mathematics, the DIG program should be easy to understand and use. Others will find the written documentation for DIG lacking in its attempts to convey the game's constructs and how they are related. Fortunately,

sample matches found on the information disk do an excellent job of explaining what EQUATIONS and its cryptic terminology are all about.

The DIG program combines diagnosis, instruction, and gaming in individualized learning experiences. Students easily identify content areas in which they may be weak by using "Big Diagnostic", which is available on the computer or in paper-and-pencil form. "C-Exercises" teach the mathematics but the level of instruction is below average. The presentations are frequently wordy and often poorly managed on the screen. In contrast, "R-Exercises" work better as instructional agents. They give analyses of correct answers to exercise questions and offer short lessons on specific topics. In this way, algebraic skills on which students need practice are targeted. Special kits ("A-Flub," "P-Flub," or "Move") are suggested for further study in a game setting.

The game is played between Mate (the computer) and a student. The object of the game is to arrange given mathematical expressions (called Resources) into a single mathematical expression (called the Goal). The student must analyze Mate's play and correctly identify the appropriate next move to make. Possibilities include: (a) moving a Resources, (b) challenging the previous play, or (c) declaring a "force-out".

An excellent feature of DIG is that Mate plays by a teaching strategy rather than a winning one. So, the student can always tie the game and can frequently win. A pedagogically unsound feature of DIG is some of its notation. For example, the program uses "*" for exponentiation and "@" for root operations. Consequently, the horizontal representation of many algebraic ideas is awkward and does not support what is taught in the classroom. The authors correctly emphasize the importance of using tournament play (among students) to get the full educational value of the program. Procedures for setting up and running EQUATIONS tournaments are explained in detail. In addition, insights and suggestions based on the author's experiences with tournament play are offered.

The set of DIG disks is assigned a key that must be inserted into the game I/O slot before a program disk can be used. Other program disks are not usable in machines without this key. At \$600, the program would be a good buy if program disks could be used simultaneously in several machines. Nevertheless, it is worth investigating. - Lee V. Stiff, North Carolina State University, Raleigh, NC

A Simple Solution

EQUATIONS

CHALLENGE MATCHES

Wff 'n' Proof Learning Games, 1490
South Boulevard, Ann Arbor, MI 48104
Educational math-game software; any 48K
Apple II, one drive
\$44.95

Ease of setup	■ ■ ■ ■
Ease of use	■ ■ ■ ■
Documentation	■
Support	■ ■
Overall	■ ■ ■ ■

Most games claiming to be educational fail to deliver on their promises. They provide instead either unsound teaching based on a dazzling display of programming skill, or adequate teaching in poorly planned, bug-filled programs. *Equations Challenge Matches* is one of the rare exceptions. It's well written, and it can effectively teach mathematics.

In this computer variation of the board game of the same name, matches take place between the student and the computer, or between two players. The game randomly selects numbers and mathematical operations, and from these "resources" chooses a goal. You meet this goal by using resources no more than once each, along with parentheses, to form an equation.

On each turn, a player limits the possible equations by moving one of the resources to "permitted," "required," or "forbidden" status. The game ends when no legal move remains (a force-out), or when one player makes an error (flub) and is challenged successfully.

There are three types of errors: A P-flub prevents you from forming any

valid equations; an A-flub unnecessarily lets you form a solution that uses exactly one of the resources; and a C-flub is a failure to challenge a previous flub.

The player who suggests a solution, whether as part of a challenge or in the face of one, must prove it by producing the equation. If it's correct, the player wins and receives ten points.

A Tool for Math Teachers

The *Equations* package contains three disk sides on two floppies. The *Diagnostics Instructional Gaming (DIG)* program is a series of "set" matches, played between you and "Mate" (the computer). Mate moves in ways that let you win, occasionally making a flub, but always challenging a student's flub.

The *Introduction to Equations* tutorial program explains all the rules through actual game situations, showing the last move, and asking for the next appropriate move. Although there are a few errors in spelling and punctuation in this section, it's better than average on the whole. This is helpful, because the accompanying manual is too brief to be of much use.

The *Equations Challenge Matches* disk sets up a series of contests with resources already chosen. Here, a two-player game is established, with the computer acting as game board, referee, and prompter. For instance, if you can't sustain a P-flub challenge when a solution exists, the computer might say, "You could have used $12 = 9/3/4$."

You can use equations to teach mathematical concepts at several levels. The preview disks I reviewed contained a wide sampling of material, from simple addition and subtraction to polynomial factoring and logarithms.

No Pizzazz

Quality teaching and programming are evident here. None of the programs crashed, errors are well trapped, and the assistance the program provides is actually helpful.

There are some negative points, though. These materials are definitely outside the mainstream of computer gaming—there's no attempt to spruce things up with good graphics, the package keeps no running score or record of high scores, and the program includes no sound effects—in short, it lacks pizzazz. That will reduce *Equations'* appeal for students.

The program replies to wrong answers with a blunt "incorrect"—the developer should have used a gentler approach. And there's no warning that the preview disk won't boot if it's write-protected.

Equations poorly handles two mathematical concepts. It uses x for multiplication, which is satisfactory, but it uses an asterisk (which most systems use to indicate multiplication) rather than a caret for exponential notation. This is likely to be confusing for students who are familiar with programming. In addition, the notation A/B is explained as "the logarithm of B to the base of A." Both the poor wording and the choice of symbols are guaranteed to confuse you.

The P-system lurking behind the program is also evident. Things move along slowly through innumerable disk accesses, especially in the tutorial material, where the drive turns on every few seconds.

I rather like *Equations*, and may buy some of the disks for my children. For schools, the publisher offers a site license for the *DIG* math program, at a cost of \$100 per machine. (Single-item purchase of the entire set would be unreasonably expensive.) The bottom line is that *Equations* gets a somewhat qualified nod of approval. ■

Rick Sutcliffe
Aldergrove, B.C.
Canada

June 1986

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Publisher's Note: WFF 'N PROOF Learning Games Associates will only print complete reviews out of fairness to readers. We do, however, wish to respond to several concerns raised.

- 1. NOTATION: Computer versions of EQUATIONS attempt, as much as possible, to use the same notation as the manual version of the game. In the manual game, operation signs appear on cubes which are arranged horizontally to create expressions. The use of '*' for exponentiation and 'x' for multiplication in the game predates the invention of microcomputers by at least a decade. Unfortunately, the authors of BASIC and other languages did not elect to use the same notation as EQUATIONS. We have found, however, that EQUATIONS' success in teaching the idea that notation is an arbitrary convention is valuable in its own right and is certainly not a problem in the classroom.*
- 2. PRICING AND KEYS: We originally used keys with the DIG Math Program to allow customers to make unlimited backups for this sixteen disk program. We have since found that users prefer not to have keys so we no longer use them. The current retail price of the DIG Math Program is \$450.*